ABSTRACT

# INTERACTIONS BETWEEN SPECIES WITH PARAPATRIC DISTRIBUTIONS: A CASE IN *BARYTETTIX* (ORTHOPTERA: ACRIDIDAE: MELANOPLINAE)

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Surprisingly little is known of the actual edge of the range of most orthopterous. At least one study of the contact zone between related species has led to a new theory of speciation (stasipatry, White *et al*, 1967), and I suspect that further studies will reveal other biological situations which cannot be fully explained by current theory. Such a case has been worked out in the genus *Barytettix* (revised by Cohn & Cantrall, 1974), a short-winged melanopline occurring in northwestern Mexico and southwestern United States.

*Barytettix h. humphreysii* (Thomas), with a wide distribution in western Sonora and southeastern Arizona in desert, desert grassland and thorn scrub habitats, is in parapatric contact with B. *b. cochisei* Gurney, which occurs in similar habitats mainly in eastern Sonora and southeasternmost Arizona. Six intensive transects have been made across the zone of contact and surveys have been made in several other areas near the probable contact zone. These collections suggest that the two forms are in contact or within breeding range for the entire length of their ranges, a distance of about 500 km. Nowhere have the two forms been found together or one within the range of the other. In each of the transects hybrid populations have been found forming a cline between the two parental types. The hybrid zone is invariably less than 10 km, an unexpectedly narrow zone for such active and abundant grasshoppers.

The hybrid nature of these populations has been confirmed by their similarity to laboratory produced hybrids in seven diagnostic aedeagal characteristics. Analyzed by hybrid index technique, the hybrid populations show more variation than adjacent parental populations. Individuals in the middle of the zone sometimes show a mixture of parental characteristics, but most are, to a large extent, intermediate, and no pure parental types are found there. These same characteristics of hybrid zone populations are found in the north in Arizona at 1700 m. in elevation, and far to the south in Sonora at 200 m. There is some leakage of one or two characteristics beyond the zone for short distances.

Current theories of speciation do not account for this situation. 1) If *cochisei* and *hymphreysii* are species and hybridizing only in hybrid habitats, then they should overlap somewhere along the contact zone. No such overlap has been found, nor is the habitat in

the known hybrid zone obviously intermediate. The two forms seem to occupy generally similar habitats in nearby areas. 2) The situation might represent a case of recent contact between two previously isolated demes, the two now completing the development of reproductive isolating mechanisms. Under this interpretation it is difficult to understand why the characteristics of the hybrid zone populations are similar in both Arizona and Sonora separated by distance of 500 km, and at both high (1700 m) and low (200 m) elevations. Somewhere in this long zone the contact must be older, or habitat differences might produce different rates of speciation. Either would result in different kinds of populations in the zone of contact, some of which should contain parental types. 3) The same problems are encountered with the interpretation that the two forms are now merging after initial isolation. Variation in the width of the hybrid zone correlating with different habitats and different time of initial contact would be expected but is not found. 4) Finally, stasipatric speciation does not seem to apply. We have been unable to find any chromosomal isolating mechanisms. Completely hybrid, as well as backcross, populations are common in the hybrid zone, and one has been in existence for over 50 years. This contradicts preliminary evidence that our laboratory $F_1$ hybrids are sterile or cannot mate.

This case of hybridization between *Barytettix h. humphreysii* and *B. h. cochisei* demands a new theory of species interaction.